A Photoelstic investigation of stress distribution in laterally loaded thin plates simulating window glass panels

Yousif Tawfiq Sammour

Civil Engineering

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Abstract

The photoelastic investigation presented in this thesis attempts to develop data on the stress distribution and deflections in square thin plates subjected to lateral uniform pressure. The present study is a preliminary investigation as a prelude to a future comprehensive research program. The directly relevant structural application is to the design of window glass panels under wind loads.

The stress distribution and deflections have been established for three boundary conditions and two levels of lateral pressures. The edge support conditions studied are simply supported, those pertaining to typical window framing system and window framing system with corners clamped. Flow of membrane and combined membrane and bending stresses, membrane and bending shears and membrane principal stresses have been evaluated for the whole plate. Deflections have also been recorded for the plate surface for two loading levels. Comparison of photoelastic results with stresses evaluated using strain gauge technique at plate center shows good agreement.